

PATENT SPECIFICATION

562,236

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No. 7917/42

(Patent of Addition to No. 537,077, dated Dec. 13, 1938)

Complete Specification Accepted: June 23, 1944.



COMPLETE SPECIFICATION

Improvements in or relating to Gas Turbine Installations

We, SUTZER FRERES SOCIÉTÉ ANONYME, a Company organised under the Laws of Switzerland, of Winterthur, Switzerland, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention relates to a gas turbine installation and is an improvement in or modification of the apparatus described in the specification of the British Letters Patent No. 537,077. That installation or plant is of the type in which the working medium is compressed, then heated, and afterwards expanded in at least one gas turbine doing effective work; a part of this working medium circulating in a closed circuit or working cycle, whilst another part is withdrawn from that circuit and replaced by make-up working medium. According to that invention the working medium withdrawn from the closed circuit is made use of as combustion air for heating the working medium in the circuit and the process takes place under a pressure above that of the atmosphere, the pressure level in the closed circuit being altered to regulate the plant.

According to the present improvement the charging compressor operating without intermediate cooling delivers fresh air direct into the preheater of the plant. The gases of combustion from the air heater pass thence to the exhaust gas turbine without giving up heat in a preheater. The fresh air is introduced into the circuit at a place in the preheater where the air on the low pressure side of the preheater has at least approximately the same temperature as the entering fresh air.

The object of the present improvement is to obtain by means of a simple arrangement an overall efficiency in the plant which will be as good as that in the plant described in the specification of the Patent No. 537,077.

In the accompanying drawings, Figure 1 illustrates an example of a plant as described in the specification of the Patent No. 537,077.

Figure 2 shows a simplified arrange-

ment embodying the present improvement.

Referring to Figure 1, there are shown there the low and high pressure parts 1 and 1a of the main compressor, the intermediate cooler 4, the recuperator or main preheater 5, an auxiliary preheater 5a, and a heat exchanger 6 which functions as an air heater. 7 and 9 are the high and low pressure turbines, 11 is the cooling heat exchanger, and 14 the exhaust gas turbine which drives the low and high pressure charging compressors 15 and 15a which are provided with an inter-cooler 13. Fresh air is introduced at 28 into the closed circuit from the compressors 15, 15a. An electric generator 19 is driven by the plant which is provided with an output-balancing machine 17 associated with the charging compressor set comprising the turbine 14 and the compressor 15.

The working medium is drawn through the pipe 30 into the turbo-compressor 15 and passing through the intermediate cooler 13 the compressed air flows from the compressor 15a to the place 28 where the air is flowing through the pipe 29 from the low pressure turbine 9 after passing through the main preheater 5. The air is cooled in the heat exchanger 11 and enters the main compressor 1, 1a, an intermediate cooler 4 being provided between the two parts of this compressor. The compressed air is led through the main preheater 5 and through the auxiliary preheater 5a where it is preheated and then further heated in the air heater 6.

The first part of the expansion takes place in the high pressure turbine 7 and a further part of the expansion in the low pressure turbine 9. After passing through this turbine 9 a part of the air is led into the main preheater 5 through the pipes 31, 32 while the other part flows through the pipe 33 into the air heater 6 in which fuel is burnt being injected through the pipe 34. The resultant hot gases of combustion heat the air flowing through the nest of tubes comprised in the air heater 6 and these combustion gases being thus cooled are led through the auxiliary preheater 5a. The final expansion of these

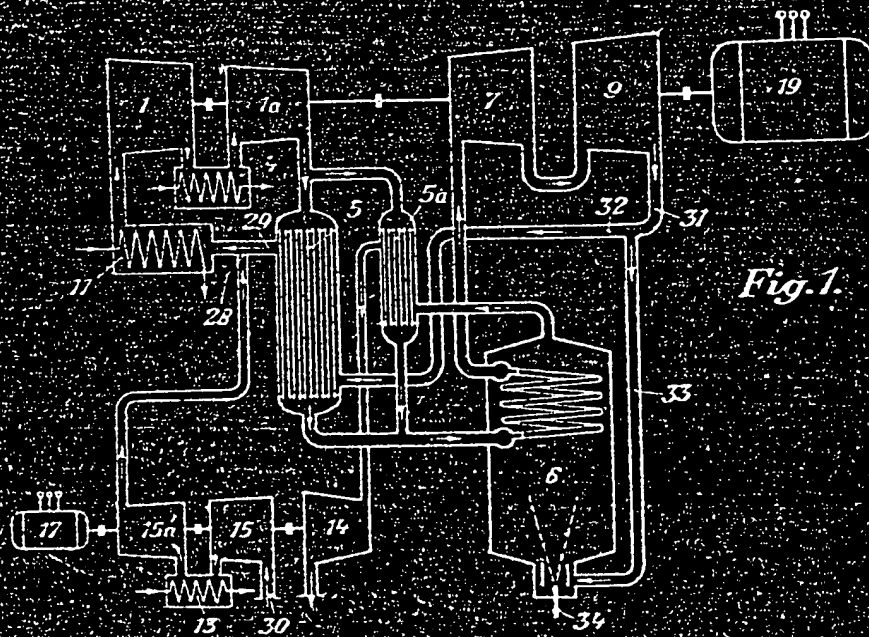


Fig. 1.

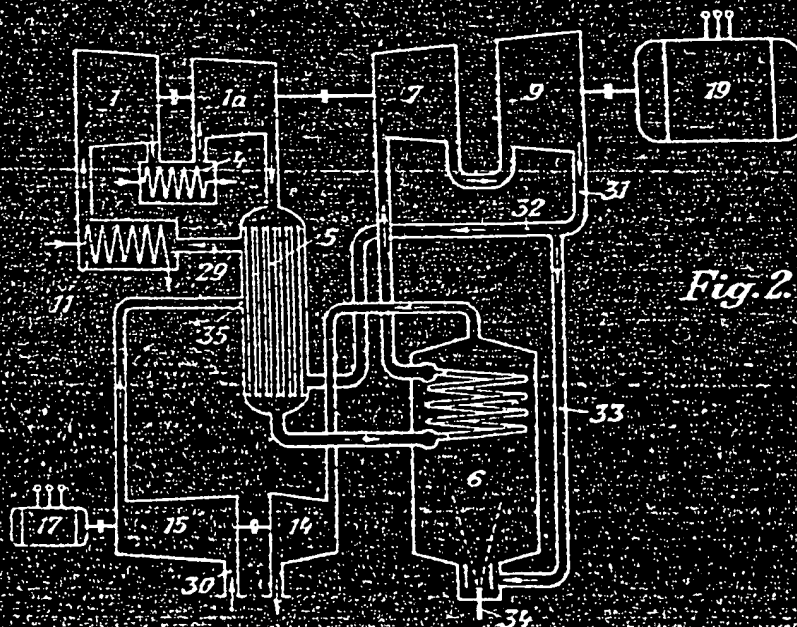


Fig. 2.